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ABSTRACT

Results are given of a six-week effort to (1) define the knowledge and skill requirements for successful performance as a Planning-Programming-Budgeting (PPB) systems analyst, (2) determine how these requirements are best acquired, and (3) evaluate the implications for the training programs of the Civil Service Commission. The findings in relation to (1) above are a firm grounding in economics, capable with figures but not necessarily a mathematician or statistician, have a logical mind, be able to sell analysis to decision makers, have broad experience in analysis, and know the uses and limitations of analytical techniques. It was found that there is no training program currently producing sizeable numbers of analysts with PPB analysis capabilities. Recommendations are as follows: (1) Bureau of Training and Civil Service Commission top management should consider extending the Commission's leadership role in promoting sound PPB analytic training; (2) the 9-month Educational Program in Systematic Analysis should be refashioned to either provide for two separate tracks--one for younger Federal employees and one for mid-career executives--or should be specified as a "mid career development" program; (3) establish a separate "PPB Tool Extensive" course for beginning analysts in Federal service; (4) continue existing "PPB Orientation" and PPB Fundamentals" courses, but expanded on how PPB fits into the real political world; (5) continue to develop and promote "PPB Tool Intensive" courses; and (6) establish programs to aid agencies in recruiting analytically trained college graduates. Samples are given of existing university courses and PPB Tool Extensive Training program. (DB)

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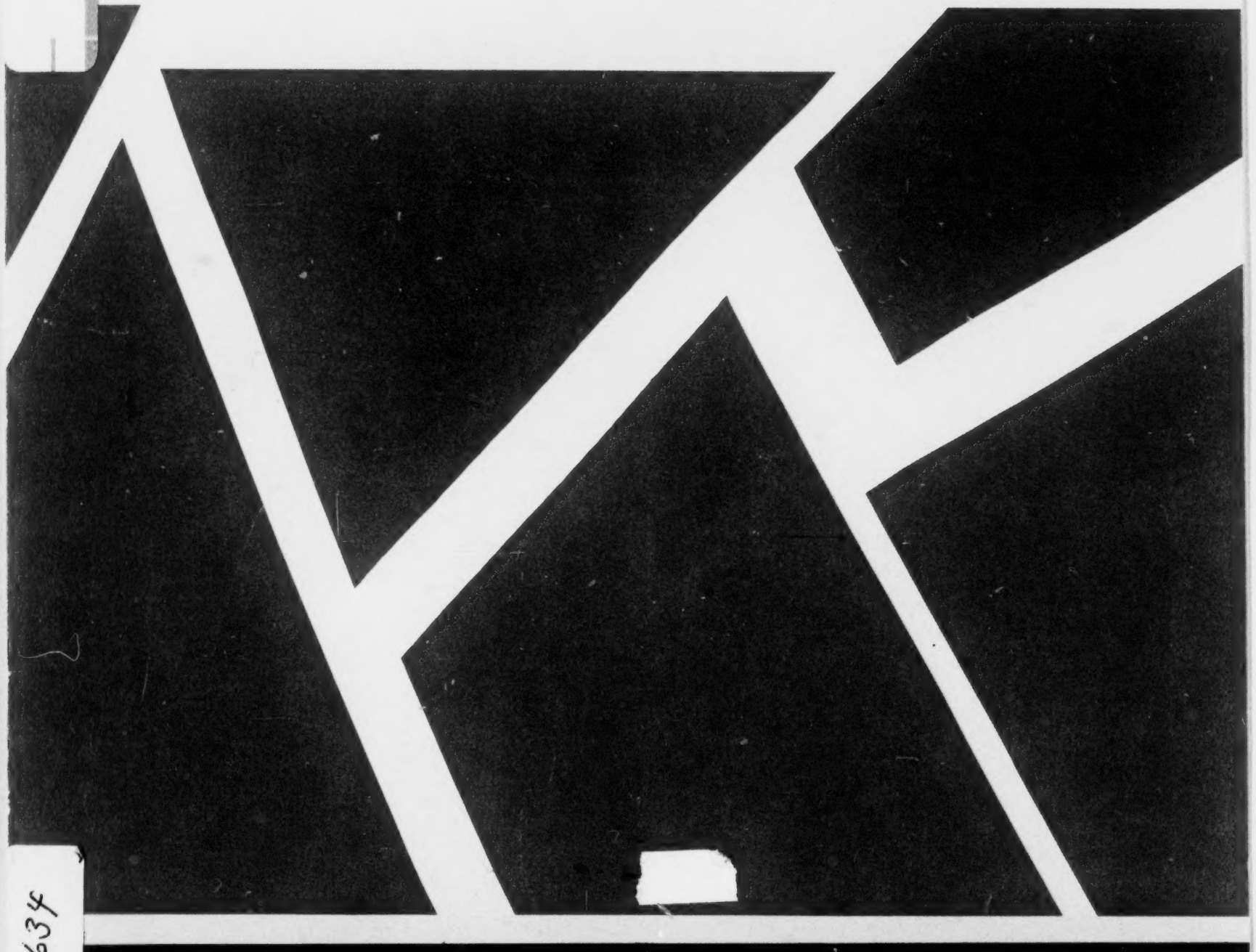
The PPB Systems Analyst: Skills and Training Requirements



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U.S. CIVIL SERVICE COMMISSION
BUREAU OF TRAINING
FINANCIAL MANAGEMENT & PPB TRAINING CENTER

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THE PPB SYSTEMS ANALYST:

SKILLS AND TRAINING REQUIREMENTS

A Report to the
Financial Management & PPB
Training Center
Bureau of Training
U.S. Civil Service Commission

by

Dr. Augustus B. Turnbull III

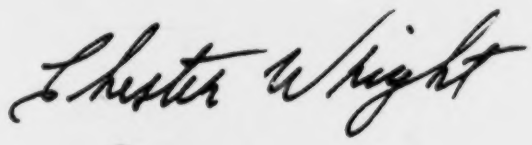
August, 1969

FORWARD

This study was undertaken for the Financial Management and PPB Training Center by Dr. Augustus B. Turnbull II, Assistant Professor of Political Science, University of Georgia. As noted in the study summary, the purpose was to define the knowledge and skill requirements for PPB analysis and to use this information to improve the quality of Civil Service Commission training programs.

The motivating force behind the study was our commitment to one of the basic postulates of the arts we teach. It is not enough to merely believe you know; you must examine the foundations of your presumed understanding as rigorously and systematically as possible. Dr. Turnbull, with no personal or professional stake in the outcome, provided us with a competent and neutral study.

Upon submission, the completed study contains information and insights of broader interest than we had anticipated. It will be, as we had hoped, of great assistance in restructuring and improving our programs. In addition, it should prove to be an invaluable guide to any organization faced with the task of staffing an analysis group or developing a training program to support an analytic effort. It is for the benefit of these latter that this study is published.



Chester Wright
Director
Financial Management & PPB
Training Center
Bureau of Training
U.S. Civil Service Commission

SUMMARY

Purpose

To define the knowledge and skill requirements for successful performance as a PPB systems analyst; to determine how these requirements are best acquired, and to evaluate the implications for the training programs of the Civil Service Commission.

Findings

There is an analytic continuum ranging from quite determinate to highly indeterminate problems. The skills required for analysis vary as one moves along the continuum. Toward the determinate end, specific and often complex mathematical techniques can be employed with success; toward the indeterminate end, the key task is the definition of the problem and deciding which of a great variety of analytic techniques is appropriate. These indeterminate problems are less susceptible to rigorous quantification but even simple mathematical analysis, if formulated properly, can provide valuable new insights for the decision-maker.

A wide mix of academic disciplines and techniques is evident in the analytic community. The conceptual foundation is that of systems analysis. A firm grounding in economics is essential; the analyst must be comfortable with figures, but not necessarily a mathematician or statistician. Innate characteristics such as a logical mind and an ability to reach rational decisions with inadequate data are highly desirable. The ability to "sell" analysis to decision-makers is essential. Broad experience is highly valued -- "the best way to learn how to do analysis is to do lots of it."

Much of the analysis being performed does not require the use of highly sophisticated techniques (e.g., linear programming and statistical tests) and where these are used, it is often possible to secure technicians to do them. The analyst, therefore, must know the uses and limitations of techniques but does not necessarily have to carry out the detailed computations.

Current short-course training provides a useful introduction to PPB systems analysis but even more emphasis on practical applications would be helpful. The nine month Educational Program in Systematic Analysis is highly regarded as an intellectually broadening and stimulating experience, but questions are raised as to its efficiency in turning out trained analysts. A gap exists in that no training program is now producing sizeable numbers of analysts ready to perform PPB analysis.

Recommendations

The following recommendations are made:

1. Top Bureau of Training and Civil Service Commission management should consider extending the Commission's leadership role in promoting sound PPB analytic training. Possible steps could include:

   (a) joint sponsorship with the Bureau of the Budget of a PPB Inter-Agency Training Coordinating Council (or the activation of a similar effort within existing channels) to promote a more unified approach to PPB training in the Federal analytic community.

   (b) more positive use of PPB principles in the Commission itself.

   (c) extension of PPB training to the curricula of the Federal Executive Institute and the Executive Seminar Centers.

   (d) using PPB training as a prime vehicle for promoting (and testing) the Federal role in providing training to state and local officials.

2. The Educational Program in Systematic Analysis should be refashioned in one of two ways:

   (a) establish two separate "tracks" -- one for younger Federal employees designed to turn out trained PPB analysts and one for mid-career executives in which imparting a greater appreciation for analytic decision-making is only part of a "mid-career development" program.

   (b) specify that EPSA is such a "mid-career development" program and

3. Establish a separate "PPB Tool Extensive" course for beginning analysts in the Federal service. Such a course could be handled in a variety of ways:

   (a) through a nine months EPSA-like program with colleges around the country. In this case the program should be much more tightly-integrated than the current EPSA and tailored to fit the needs of each individual.

   (b) through extended, after working hours, degree programs at colleges convenient to Federal employees. Such programs should fit the criteria of (a) above but would be non-residential and completed over a much longer period of time.

   (c) through intensive residential programs taught by the Civil Service Commission through (1) the Financial Management and PPB Training Center, (2) the Federal Executive Institute, or (3) the Executive Seminar Centers. Such in-house efforts would probably give the highest return for dollar expenditures.

4. Continue existing "PPB Orientation" and "PPB Fundamentals" courses but seek to expand instruction on how PPB fits into the real political world and on how its analytic techniques can be applied successfully in that environment.

5. Continue to develop and extensively promote "PPB Tool Intensive" courses again stressing practical applications and limitations.

6. Establish programs to aid agencies in the recruitment of analytically trained college graduates.

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THE PPB SYSTEMS ANALYST: SKILLS AND TRAINING REQUIREMENTS

by Augustus B. Turnbull III*

INTRODUCTION

This is a report of a six-week effort to define the knowledge and skill requirements for successful performance as a PPB systems analyst, to determine how these requirements are best acquired, and to evaluate implications of the research for the training programs of the U.S. Civil Service Commission.

The introduction of the Planning-Programming-Budgeting System in the Federal Goverhment has been marked by considerable differences of opinion as to both its ultimate purpose and the methods by which this purpose can best be achieved. There has been, however, general agreement that one key element of PPBS is the integration of open and explicit program analysis into the decision-making system. Agencies were encouraged to develop analytic staffs reporting to the agency head or one of his immediate subordinates. In the four years since PPB was introduced into 21 civilian agencies, the PPB staffs have grown to include the equivalent of 2,477 full-time persons, of which 450 are at the departmental level.[1]

These PPB staff people were acquired in numerous ways -- by hiring from outside government, by raiding the Department of Defense or other agencies with existing analytic staff, and by re-assigning personnel from a wide variety of other government positions. This large scale shift

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in responsibilities has created the need for a massive educational and re-training effort. This study was sponsored to help in that effort and is based on a wide variety of recent research on the application of PPB in the Federal Government and on interviews of government analysts and those engaged in training analysts. The study focuses on the analytic skills which are in use now on the assumption that for the present emphasis should be placed upon skills useful currently rather than upon skills which might be useful sometime in the future.

Several caveats should be noted:

(1) the analytic activity of the Federal Government is in a high degree of flux and uncertainty. This report seeks to impose a certain order upon it, but other viewpoints could undoubtedly have validity.

(2) despite what the author considers to be significant agreement among respondents, the number of people interviewed and the number of agencies they represent is necessarily limited. This narrow sample should be kep in mind when considering the report's recommendations.

(3) as a summer professor the author has a necessarily limited understanding of what the Bureau of Training is already doing or what it may have tried and abandoned in the past. Thus despite earnest efforts to avoid it, this report may include elements of "reinventing the wheel".

(4) no effort has been made to subject the report's recommendations to a cost/benefit or even a cost/effectiveness analysis. To the extent that such an analysis is necessary, the author must plead guilty in that his study concludes by recommending another study.

GOVERNMENTAL BACKGROUND OF PPB SYSTEMS ANALYSTS

There is no agreed-upon definition of a PPB systems analyst. There is no such Civil Service position classification nor any immediate prospect of one being established. The identification technique used by recent Bureau of the Budget/Civil Service Commission and General Accounting Office studies[2] of PPB implementation is simply to locate individuals actually working on formal PPB documents and to call them PPB analysts.

These individuals hold a wide variety of positions but most fall into six class series.[3]

TABLE 1

Positions Most Commonly Held by PPBS Analysts

Title	Classification Series	Number
Program Analysis	(GS 345)	97
Miscellaneous Administrative & Management Positions	(GS 301)	81
Economist	(GS 110)	41
Operations Research	(GS 1515)	21
Budget Administration	(GS 560)	12
Management Analysis	(GS 343)	10
Other		83
Total in Sample		345

A brief description of the work considered typical[4] for each of these six class series plus a summary of the kind of experience required gives a general indication of the kind of person who is doing PPB analysis.

Program Analysts evaluate the effectiveness of programs in achieving their objectives. They develop and recommend changes in program objectives and operations and in adjustments in resource utilization to resolve problems. Experience may be in various fields so long as it gives an understanding of the interrelationships among operating programs. Particular positions cited include the direction of line operations, management analysis, statistical survey work, budget work, financial management or analysis and personnel management requiring collaboration with operating officials.

Miscellaneous Administrative and Management Positions refer to those for which no specific qualification standard exists. Incumbents are expected to understand the basic processes of managing and administering an organization.

Economists investigate and evaluate information, reports and legislation for their economic implications or applications. They manage, direct, or contribute to a variety of programs whose purpose is to record, evaluate, or influence economic conditions. Educational requirements are relatively specific in requiring economics courses, and experience must demonstrate competence in the use and understanding of economic principles.

Operations Research Analysts use mathematical and other scientific methods to analyze operations problems of decision-makers and provide advice on the probable effects of alternative solutions to these problems. Individuals must have had coursework or professional experience in operations research, mathematics, statistics, logic or other courses which require substantial competence in mathematics or statistics.

Budget Analysts must have a general knowledge of management principles plus experience in the development, evaluation or revision of budgetary control systems or budget preparation and presentation. This experience may be gained as an operating official or professional worker in a specialized program area as well as by being a specialist in budget work.

Management Analysts must combine a high order of analytic work with the systematic application of a wide range of management functions, practices, and methods for the purpose of improving the effectiveness of organizations. Qualifying experience is acquired in such positions as management engineer, management consultant or other staff positions in which the individual has made comprehensive studies of organization, operations or procedural systems.

It is evident from reviewing these six position classification series, without considering the other 29 positions turned up by the BOB survey, that a wide variety of individuals are involved in PPB analysis. Of what, then, does PPB analysis consist? Can the task be defined more precisely?

THE TASK OF PPB ANALYSIS

First, the term "analysis" itself should be defined. The GAO provides a useful definition.[5]

> Analysis is a method of investigation by which a solution to a complex problem is sought by separating the problem into simpler, more understandable elements. Then, by study of the behavior and interaction of these elements, a better understanding is gained of the complex problem.

The GAO also states the purpose of analysis in these words.[6]

> As a reasoned approach to highly complicated problems of choice, analysis can provide agency decision-makers with a more rational basis for making such choices.

The subject of analysis is usually considered to be a system consisting of interrelated elements oriented toward a goal or objective. A convenient summary of the steps of systems analysis has been given by Guy Black.[7]

> "/1./ understanding the objectives in the context of the environment in which the system is to operate . . .
>
> "2. stating in an analytically manageable way the interrelations between variables chosen for the analysis, and the objectives; this amounts to construction of a model;
>
> "3. quantification of functional relationships between elements of the model and "output", which is often described as the "benefits";
>
> "4. quantification of functional relationships between elements of the model and "inputs" or resources needed;
>
> "5. the combination of (3) and (4) into an overall model characterized by an input-output relationship that flows through the model;
>
> "6. the determination from the input-output relationship of that choice of all possibilities of system characteristics and manner of operation that produces the most desired result, and operating rates that correspond to that optimum."

These statements, however, apply to analysis in the abstract. When the limiting adjective "PPB" is added, the problem of definition becomes much more complex because of the intense debate over the merits of the Planning-Programming-Budgeting System itself and its relation to the traditional budgeting process. There are indeed wide differences of opinion over the purpose of PPBS. These differences find expression in such disputes as whether or not PPB is "for" agency management or the BOB. Another broader issue is whether its purpose is simply to provide better financial management or a revolutionary new form of economic decision-making designed to cope with the burgeoning economic enterprise activities of government.[8]

The present trend stresses the importance of PPB as a tool of agency decision-making. A representative of the Bureau of the Budget makes this point explicit:[9]

> At present, there is a tendency to think of PPB as a tool primarily for the Budget Bureau. This is not the intention, and should not be the result. Each agency head is responsible to the President and he to the Congress for national policy in his area of public responsibility; PPB should be a tool for agencies to use in meeting this responsibility. It should be made clear that the Cabinet officers and other agency heads are primarily responsible for its implementation and use.

Given the emphasis on agency use of analysis, the present study has concentrated on analysis within the agency as opposed to inter-agency analysis as might be applied by the Bureau of the Budget or other coordinating entities. As noted above, it has also assumed that work now performed by those preparing PPB documents constitutes the kind of analysis needed for PPB. There is an obvious tautology here -- the assumption that what is being done is what <u>should</u> be done. The problems raised by this assumption are discussed in the recommendations section of the report.

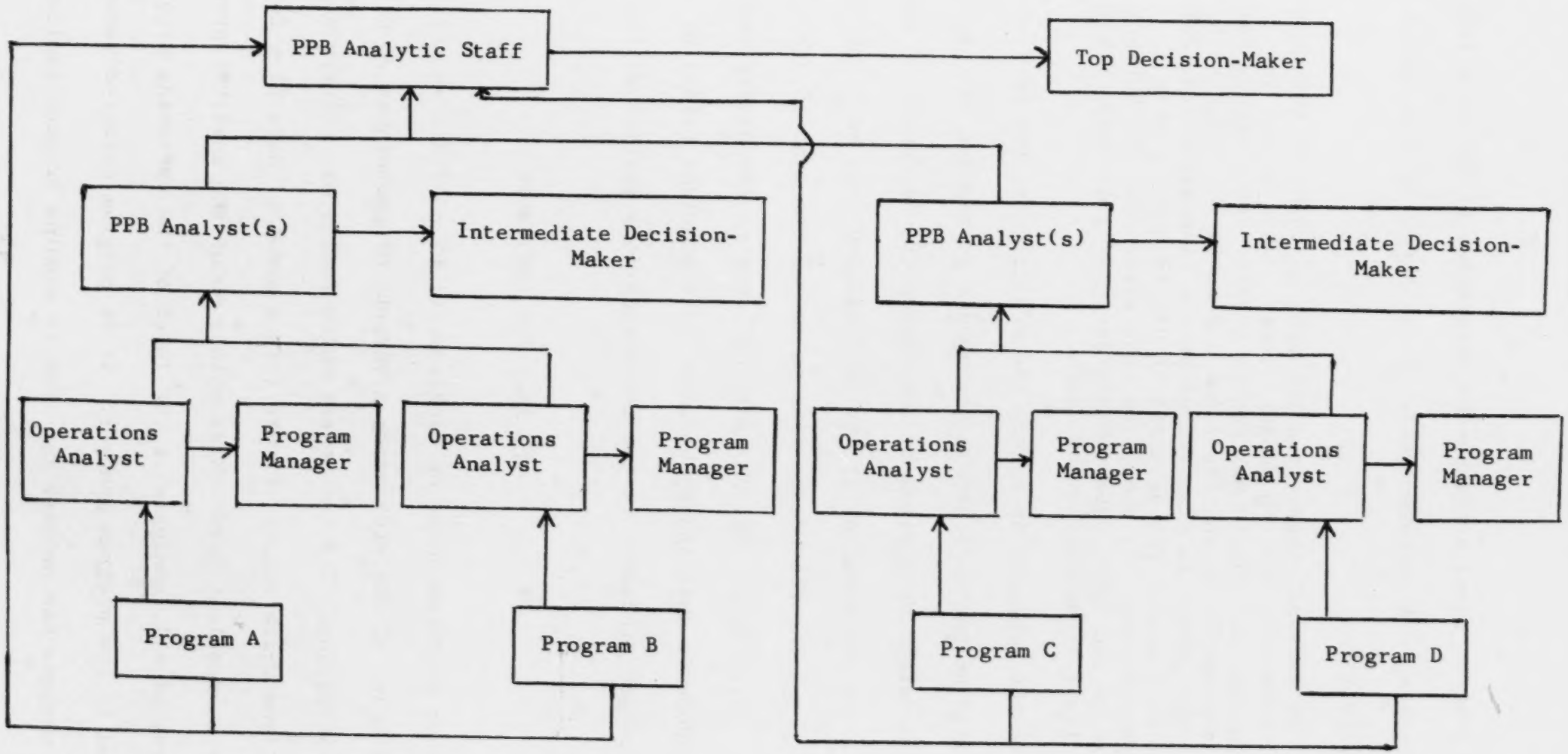
THE ANALYTIC CONTINUUM

Agency practice shows no single model of analysis -- rather there are many types of analyses using a variety of techniques at different levels of sophistication. The two models which follow may clarify some of the distinctions which occur. Figure 1 is a model of data flow for PPB analysis. It shows in simplest terms three points about the analytic process.

First of all, analysis at the level of the operating program should be useful to the program manager. It is program-oriented because the program manager has neither the time to examine broader implications nor

FIGURE 1

Hypothetical Model of Data Flow for PPB Analysis



nor the ability to exert influence upon such external processes even were he to take the time.

Second, typical PPB analysis first becomes useful at the intermediate organizational level where more than one program must be considered. Here an intermediate decision-maker must make priority judgments among programs. He relies upon both his program managers ("line" relationships are not shown in Figure 1) and his own analysts. These analysts get their data on the program through the operations research staffs connected with the program and independently through "raw" data on the program itself.

Third, the top decision-maker needs an analytic team with varied talents becuase of the numerous aspects and implications of major programs which must be analyzed. The principal task of this staff is to support the decision-maker as he makes judgments among all of the programs of the agency or department. This staff, too, has access to "raw" data as well as summary analytic studies conducted by subordinate staff.

The model in Figure 1 illustrates the need for a sophisticated information system on program data which can serve the needs of decision-makers and their analytic staffs at several levels. By imagining the complexity of a model showing more than three levels and four programs and including line-authority channels, the magnitude of information demands for a truly comprehensive analytic effort becomes clearer.

In a real world organization, of course, the analytic process cannot be delineated so simply. The complexity of analysis varies not only according to the level in the organization in which the analysis occurs but also according to the nature of the activities performed by the organization.

According to the GAO study, the process of analysis should make the following information available to decision-makers:[10]

> "1. More concrete and specific data
> "2. Systematic considerations of possible alternative objectives and alternative programs to meet those objectives
> "3. Evaluations and comparisons of benefits and costs for alternative programs
> "4. Relationships between anticipated program outputs and resources to be expended."

The task of providing this information requires logical analysis of the system appropriate to the decision. Many kinds of analysis at different levels of sophistication are possible. Figure 2 presents a "Model of the Analytic Continuum" which depicts several characteristics of the PPB analytic process as found in our research.

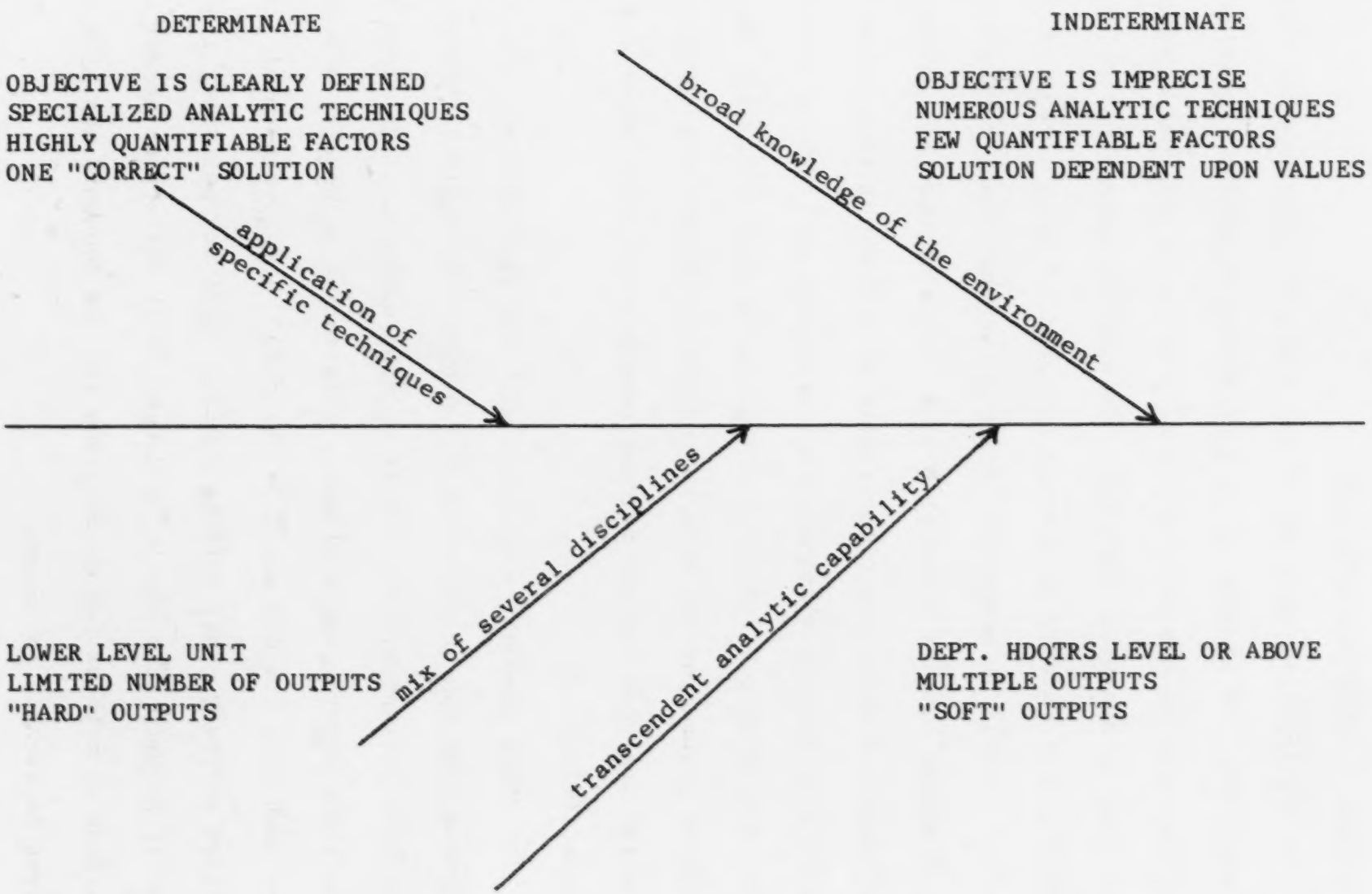
At one end of the continuum is the determinate class of analytic problems. Analysis of these problems can be termed simple in that the criteria for judging the correctness of the solution are undisputed; the actual analysis may require exceedingly sophisticated mathematical or statistical techniques. An example of this determinate type of problem would be the task of finding the least cost method of impounding a water reservoir with certain specified characteristics.

At this end of the continuum the factors involved are highly-quantifiable. The characteristics of earth versus concrete dams, for example, are well known. Given the local physical conditions the analyst can determine the one "correct" (or most efficient) solution, i.e., which kind of dam should be constructed as well as how each element of construction should be scheduled into the overall project.

This kind of task, typically, involves a lower level unit of government (the regional office of the Corps of Engineers as opposed to the Secretary

FIGURE 2

A Model of the Analytic Continuum



of the Interior) concerned with a limited number of outputs (dams or other physical projects connected with water) which are "hard" in that they are easily defined and measured.

At the indeterminate end of the analytic continuum the task is much more complex. An example of an indeterminate problem requiring complex analysis would be the elimination of poverty in the United States. The first step in analysis would be to develop an operational objective; the elimination of poverty is clearly not precise enough. What do we mean by poverty? How is it measured? How will we know when we have eliminated it? A second problem deals with time; how soon must all poverty be eliminated? A third and closely-related problem is cost. How fast do we move at what cost to eliminate what degree of poverty? A fourth problem in our system of government is assigning responsibility for the task among levels of government and between the public and private sectors. The essential analytic step of finding some resolution of these issues is a highly difficult one.

The other elements associated with the indeterminate end of the continuum also can be illustrated. A number of analytic techniques can be brought into play. The skills of many academic disciplines are needed in defining poverty and evaluating alternative methods of eliminating it -- each with its own schedule of costs. The governmental jurisdictions involved are many, thus raising complex legal and political issues. The cause of poverty is a matter of debate as is the effectiveness of a multitude of methods for eliminating it. An economic analysis of alternatives is clearly in order.

In all of these issues and the many more which are relevant to this example there are many factors which are exceedingly difficult to quantify. How does one measure the benefit accruing to an individual or family in poverty of, for example, a particular work study program or a basic reading course? What is the effect of minimum family income payments or raising the minimum wage? Certainly some measures can be applied, but these typically require heroic assumptions about cause and effect relationships as well as about the validity of the data.

Judgments about the correctness of the solution to the problem depend not only upon the acceptance of the assumptions about quantification but also upon ones value preferences. Regardless of the analyst's formulation, an individual taxpayer (or his representatives in Congress) may be unwilling to pay the cost of a particular program designed to aid in eliminating poverty. The wise use of analysis is greatly needed but may not be accepted.

This type of indeterminate analytic problem tends to occur at the upper policy-making level of a department or in the Bureau of the Budget which must set priorities among departments. Characteristically, the programs requiring this kind of analysis have multiple outputs which are "soft" in that they are not subject to precise measurement or specification. What, for example, is the output of a Head Start program?

When one attempts to define the kinds of knowledge and skills required for PPB systems analysis, the acceptance of such an analytic continuum requires that the answer be a somewhat unsatisfactory, it depends.

At the determinate end of the continuum the application of a few specific techniques may well be sufficient to resolve the problem. As the problem moves toward the indeterminate end of the spectrum, other

analytic inputs become necessary. Not only tools or techniques but broader disciplines (e.g., economics or computer systems analysis) or a mix of disciplines become necessary. The more complex and indeterminate the problem the more necessary it is to have a broad knowledge of the environment which surrounds the problem. Here the successful analyst must have an understanding which goes beyond disciplinary limits.

At the most difficult level where there is little or no agreement on the criteria for successful resolution of the problem, where key factors defy quantification and important data is often unobtainable, the successful analyst must be able to transcend both the cookbook application of specific techniques and the limits of specific academic disciplines to impose a rational solution upon a disordered real world situation.

One may well ask the logical question as to where can such paragons of analytic talent be located; the answer is that they are almost impossible to find, but that in the present day world a much lower order of analytic proficiency is often more than enough to shake the foundations of traditional bureaucratic decision-making procedures. We will now examine this conclusion by turning from this model of the analytic continuum to see what skills actually are being used by PPB analysts in the government today.

USE OF TECHNIQUES BY SAMPLES OF ANALYSTS

In order to develop some idea of what techniques are being used in PPB analysis, we examined data provided by graduates of the Educational Program in Systematic Analysis (EPSA). EPSA is sponsored by the Civil Service Commission and the Bureau of the Budget and allows selected government employees to attend graduate school for an academic year's

work in courses related to systematic analysis. Participants in this program are expected to become key members of their agencies' analytic staffs.

The EPSA graduates were asked to rank the frequency of use of certain techniques and activities on a scale of five (every day) to 0 (never). Based upon the information in their questionnaires[11] the graduates were divided into three groups: those doing PPB analytic work (N = 32), those supervising PPB analytic work (N = 14), and those not presently engaged in PPB work but still using analytic techniques (N = 30).

Each degree on the scale was multiplied by the number of responses for that degree. These sums were totaled then divided by the total number of responses to give an average frequency of use figure for each technique. These average figures were then ranked in comparison with the other techniques used by the group. The results are shown in Table 2.

The striking point shown by Table 2 is that the structuring of problems for analysis, identifying alternatives and determining costs are techniques used more frequently by PPB analysts than more specific techniques such as linear programming, sensitivity analysis, and statistical testing. The table shows also that the rankings by each group of analysts follow a similar pattern. Only a few notable differences occur. PPB analysts deal more frequently with pinpointing objectives and marginal analysis than non-PPB analysts. In comparison with the other listed techniques, non-PPB analysts rank statistical testing higher in frequency of use than do PPB analysts; in absolute terms, however, the PPB analysts use statistical testing slightly more frequently. Another significant point is that with the single exception of applying statistical tests, the non-PPB analysts use the techniques less than both the PPB analysts and the PPB supervisors.

TABLE 2

Frequency of Use of Analytic Techniques

Technique	Total Average*	Rank	PPB Analysts Average*	Rank	PPB Supervisors Average*	Rank	Non-PPB Analysts Average*	Rank
Structure Problems for Analysis	2.92	1	3.35	1	3.14	2	2.33	2
Identify Alternative Courses of Action	2.91	2	3.24	2	3.43	1	2.30	3
Identify Program Costs	2.62	3	2.71	4	2.71	3	2.47	1
Critique Others' Analytic Work	2.51	4	3.00	3	2.14	4	2.13	4
Cost/Benefit Anal. Familiar Programs	1.91	5	1.97	7	2.00	5	1.80	5
Pinpoint Objectives	1.86	6	2.35	5	1.93	6	1.27	8
Use Marginal Analysis	1.72	7	2.35	5	1.64	7	1.03	11
Cost/Benefit Anal. New Programs	1.64	8	1.97	7	1.43	9	1.37	7
Apply Discounting Techniques	1.56	9	1.76	9	1.50	8	1.37	7
Apply Statistical Tests	1.37	10	1.41	10	1.21	11	1.40	6
Conduct Sensitivity Tests	1.19	11	1.32	11	1.14	12	1.07	10
Recognize Linear Programming Problems	1.13	12	1.29	12	1.36	10	0.83	12

* 5 = used every day; 0 = never used

One may conclude from this particular sample that while use is made of sophisticated techniques, the more frequent task is the basic one of deciding just what is the problem to be analyzed.

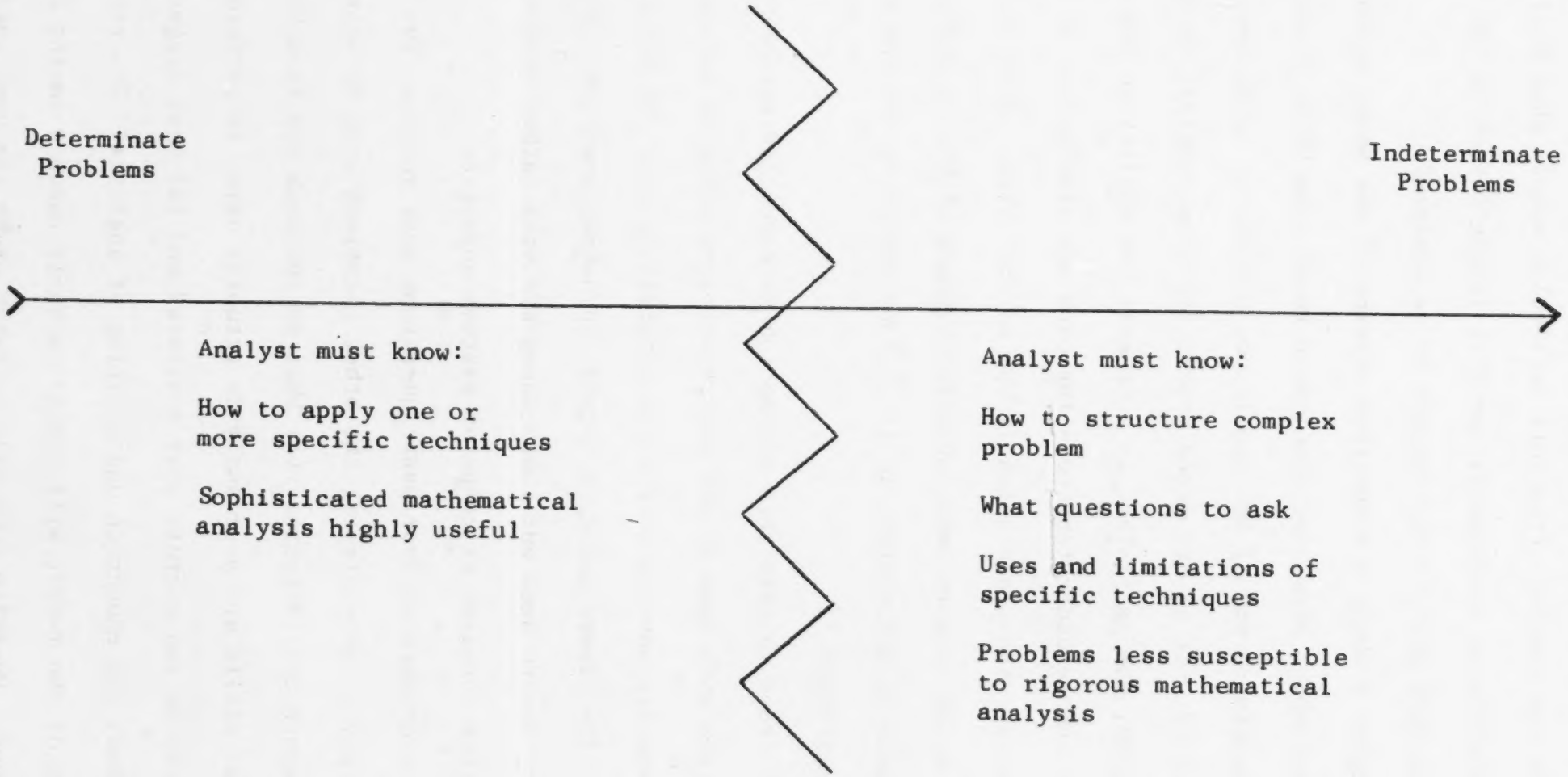
Figure 3 shows a simplified version of the Model of the Analytic Continuum which shows our conclusion based upon these findings: toward the determinate end of the continuum, ability to apply specific techniques is required, but as one moves toward the more complex, indeterminate type of problem, the key talent is much more the ability to conceptualize the problem and to understand both the uses and limitations of specific techniques rather than actually how to "do" them. This is not to say, however, that a more detailed understanding of how to apply analytic techniques is not useful; it is just not mandatory for the kind of work now being performed.[12]

In order to test this assumption we conducted extensive open ended interviews with some 20 PPB analysts representing 14 separate agencies.[13] Approximately one-third of those interviewed were the heads of analytic staffs, the others could be termed journeyman analysts. Our intention, however, was to seek out those doing PPB work rather than varieties of operations research or computer systems analysis.

The answers to four basic questions were sought. The first two were asked only of supervisors; the other questions were directed at both supervisors and analysts: (1) What do you look for in a PPB analyst? (2) What skills are your analysts actually using in performing PPB analysis? (3) Where do you recruit your analysts? and (4) What suggestions do you have about the education and training of analysts? The remainder of this section of the report will summarize their answers to the first three questions. Question four will be taken up in the next section.

FIGURE 3

Simplified Model of the Analytic Continuum


Determinate Problems
Indeterminate Problems
Analyst must know:
How to apply one or more specific techniques
Sophisticated mathematical analysis highly useful
Analyst must know:
How to structure complex problem
What questions to ask
Uses and limitations of specific techniques
Problems less susceptible to rigorous mathematical analysis

WHAT DO YOU LOOK FOR IN AN ANALYST -- WHAT SKILLS IS HE USING?

The supervisors responded first by emphasizing innate qualities such as high intelligence, a logical mind, a skeptical mind, a quantitative sense, and the ability to get along with others. Also considered of great importance is the ability to communicate with superiors. This talent seemed to have two aspects: an ability to explain technical analysis in non-technical terms and an ability to show its relevance to the decision under consideration.

A selection of typical comments follows:

> He /the analyst/ must be able to communicate, to write well, and have an inquisitive mind. He must be able to rank and select alternatives and must have common sense in addition to technical knowledge.
>
> -- Chief, Evaluation Staff of a technically oriented agency

> The analyst must have maturity -- a logical mind; he needs to know research methodology, how to present his findings so they will be accepted and an ability to work effectively with other people. He must have empathy with a decision-maker who is not analytically-trained.
>
> -- Director, Planning Evaluation & Programming Staff of one of the largest departments

> My analysts must see the real practical, down to earth alternatives. They must know that no two programs hang together the same way and must be treated differently depending upon the specific case at hand.
>
> -- Asst. Director for Ofc of Program Analysis in another large Federal agency

When pressed further to name specific "teachable" skills, the supervisors tended to make a standard response which could be paraphrased as follows:

> The analyst should have extensive program experience, a detailed understanding of economic principles -- especially micro economics; he should be comfortable with mathematics and statistics though not necessarily an expert. Of course, knowledge of when specific analytic techniques are useful and when they are not is essential.

The one academic discipline mentioned as necessary by almost all analysts and analyst-supervisors was economics. In some agencies there was considerable emphasis on hiring of individuals with graduate degrees in economics; in others it was felt that a familiarity with the basics of the discipline was sufficient.

Micro economics is considered to be particularly relevant. Macro economics was not as useful and the area of welfare economics, although thought by some commentators to be especially relevant to the theory of PPB, was dismissed by most of the respondents as not applicable.

The concept of marginal costs and benefits was felt to be very important, but most of the analysts noted the difficulty of applying marginal analysis because of inadequate data on marginal costs.

The idea of discounting and present value was the single most noted economic concept and seems to be in general use.

The respondents were asked to specify the degree to which they needed mathematical and statistical abilities. A few recounted the use of highly sophisticated techniques -- linear programming, queueing theory, regression analysis -- but somewhat surprisingly the majority indicated that simple tools were sufficient. Two even answered "addition and subtraction" when asked which mathematical techniques they used most often.

Several points seemed clear:

(1) In some agencies that were by the nature of their activities scientifically or technically oriented -- for example, the Atomic Energy

Commission and the Corps of Engineers -- considerable use was made of analytic techniques based on the sophisticated use of mathematics. In these agencies the analysts often had engineering backgrounds.

(2) In other agencies, particularly those with multiple responsibilities of a non-technical nature -- for example, Health, Education, and Welfare and the Department of Agriculture -- there seems to be a point at which highly rigorous mathematical techniques lost their usefulness because of the lack of data and absence of relevant theory.[14] In these situations the ability to apply even simple tools -- addition and subtraction -- to a problem which has been formulated properly may indeed be highly useful.

(3) Even those analysts who did not find it necessary to use much mathematics stressed that it was important to be aware of the uses and limitation of a variety of techniques so that as information systems improved, more rigorous analysis could be used.

(4) At the upper level of the larger Federal departments, there was a strong feeling that the detailed specialists could be bought. Mathematicians, statisticians, computer programmers and such, if needed, could be borrowed from existing staffs within the department or procured from outside. The real problem at this level is finding analysts who can define the problem so that the talents of many specialists can be applied in reaching recommendations which are useful to the decision-maker.

(5) Several analysts at lower levels noted the existence of "canned" computer programs which made the application of complex statistical techniques and other analytic tools relatively simple.

If an analyst is going to delve into higher mathematics the path most appropriate seems to be sets and probability, vectors and matrices, and simulations and models. Calculus, for example, was found by the analysts to be quite helpful in getting through graduate economics courses, but totally unused in actual analysis.

A knowledge of governmental budgeting and accounting is highly desirable as is an understanding of the political process. Respondents indicated that pure political science or public administration unleavened with quantitative, analytic skill was of little help, but that with such skill, knowledge of these disciplines became very useful.

There was an underlying assumption throughout the interviews that an analyst must be familiar with and able to use the concepts and techniques of systems analysis. PPB Analysis is seen as a variety of systems analysis that is pushing the state of the art into new areas. The always eclectic nature of systems analysis here leaves room for a variety of skills and talents. One may start from any number of formal foundations and by the acceptance of the systems approach and the development of rigorous analytic skills become a good PPB analyst.

WHERE DO YOU RECRUIT YOUR ANALYSTS?

Information on where PPB analyst-supervisors looked for their analysts gave clues as to what skills and talents they sought. The respondents indicated they looked for three kinds of people and in this order: (1) persons with existing analytic skills such as economists and engineers, (2) persons familiar with the department's programs and who showed an aptitude for quantitative training and (3) persons familiar with the

budgetary process of the agency. They also looked for individuals currently employed in the agency rather than turning to other agencies or outside government. This latter point is supported by the BOB study of the PPB staffs of 16 Federal agencies which found that the analysts at the central analytic office had an average of 6.5 years experience with the agency and those at the bureau level had an average of 8.3 years experience.

The importance of practical experience was stressed. Several respondents mentioned that individuals with doctorates in disciplines such as economics or mathematics often became frustrated at having analytic tasks which did not fit neatly within the boundaries of their discipline or which did not match their own research interests. One supervisor noted another problem with the use of a rigorous technique: "If the analyst tries to use rigorous methods, he tends to let the momentum carry himself beyond the point where the technique can go; he gets into an area where the data are soft and the assumptions are unsure."

Since individuals with the desired mix of professional talent and practical experience were few and even those rare individuals had had no previous dealings with Planning-Programming-Budgeting, a program of training was required.

RECRUITMENT AND TRAINING OF PPB ANALYSTS

Issues

In discussing the recruitment and training of analysts with the analysts themselves and their analyst-supervisors[15] the comments centered around four topics: (1) kind of analysis needed, (2) orientation of the analyst, (3) age of the analyst, and (4) experience needed.

The first topic has been considered in a previous section of the report with the general conclusion that there is an analytic continuum providing a need for analysts with rather diverse educational backgrounds and skills.

The second topic is the question of what comes first -- program knowledge or analytic training. So far the answer has been program knowledge in that there have been so few individuals trained formally as analysts. Agencies turned to their own program people but looked for those with quantitative backgrounds. Our interviews indicate that quantitatively-oriented professionals such as engineers and economists have been converted into PPB analysts by many agencies. The director of one central program analysis staff, for example, described what his agency did to create a PPB analysis staff as follows:

> Our staff was built up in various ways. Some skills became available through contracting organizations, but we had a cadre of people on hand before PPB who had been using models and economic analysis. These were people who came up through the engineering-economics chain and who seemed to have those talents necessary for analysis. We did very little hiring from outside; we thought it was easier to teach program people new techniques than vice versa.

The BOB study gathered some interesting data on this point. Of the PPB analysts in the 16 agencies studied:[16]

-- the average years of experience with the agency were 7.4

-- almost half (43.7 percent) of the analysts had quantitative majors in college (engineering, science, economics, or mathematics) and 30.8 percent had work experience in these quantitative disciplines

-- only 27.6 percent of the analysts had broad (i.e., non-public/non-agency) experience

-- only 26.5 percent of the staff had received PPB training.

These statistics indicate that there is much room for additional training in formal analytic processes and especially as these techniques are to be used in PPB.

Our interviews with the younger analysts revealed a consensus that program experience, per se, was not as important as understanding the analytic tools. (A few exceptions in highly complex scientific areas were noted.) These analysts felt that a few weeks or months experience in an agency would give them sufficient knowledge of the program to apply analytic techniques successfully.

This opinion leads directly to the third topic -- the age of the analyst. Confidence in the universality and applicability of the new analytic techniques was in many respects a function of age. As one analyst commented:

> The problem in imparting more expertise to existing staff is that there appears to be a point of diminishing returns. The enhanced ability is slight in comparison with the return which could be achieved from orienting those managers without any knowledge of the subject as to what can be done with proper analysis.

To put it bluntly the opinion of many analysts seemed to be a combination of the assumption that "old dogs can't learn new tricks" and the feeling that at least we have to persuade the old dogs to let us try our new tricks. Thus one analyst commented, "To some degree I'm willing to give up on those over forty or with over twenty years service; yet we are going to have to live with these people for years to come."

An academician who has been closely connected with the effort to train government personnel in the new analytic techniques agrees, "We would prefer to have younger people, those three to five years out of college; it is too hard for the older ones to adjust to the new ideas."

This tension between the new and old; the younger and the older; the analyst and the decision-maker; crops up again and again in recent studies of PPBS and its implementation. The current theme is to stress that without the approbation and active support of top management, there is no chance of success for PPB. To achieve this support it is necessary to convince decision-makers that PPB analysis is useful -- thus the stress on skill in communication as well as in analysis itself.

Yet another tension came out in the interviews -- the conflict between theory and practice; how much practical experience does an analyst need in order to do a good job of analysis? There is near universal agreement that the more experience the better. Young analysts fresh out of academia agreed with this point just as emphatically as their supervisors.

One young analyst with experience in several kinds of governmental agencies noted, "A good analyst has to be capable of logically dissecting a problem and getting down to the core of the thing. The only way to learn how is through a hell of a lot of doing."

Several others commented on the need to try out skills learned in formal training:

> I feel more and more strongly that a real wide exposure in terms of experience and background is important.
>
> I think that immediate placement in a job requiring use of the analytic skills is important. The student must work around practicing people for a long period upon return from the training program before he is able to function independently as an analyst.
>
> I don't think you can really learn to be an analyst in the classroom. You really have to cram through case after case with an experienced analyst, almost like an apprentice. I learned much more from / name_/ than I did in school.

One noted a very real danger:

> There were some people who came back /_ from school_/ and tried to use their new techniques but they have slid back into their old style of operating because of a lack of reinforcement from above.

These strong expressions of support for practical experience were closely related to the major criticism of formal training in analysis. Analysts and their supervisors felt that such training left them unprepared for the real world in which their arguments and data had to stand up against rival (and traditional) methods of decision-making.

One analyst complains, "Training should stress the difficulties of economic analysis and note that the analyst will have to apply value judgments. It should stress limitations and when one kind of tool is useful and when it is not. I have never seen this done as it should be." Another comments:

> To a large degree those people trained in a discipline enough to pursue it as a field are less likely to have any appreciation of what is happening in terms of politics and government. They need an education in the political process. It is very hard to come up with these clean-cut formulas and then adjust to the political realities.

An experienced supervisor notes that "an analyst must have empathy with a decision-maker who is not analytically-trained. He should recognize that the decision-maker, too, has needs which he may have trouble communicating."

Another experienced supervisor comments:

> You have to recognize the real world limitations and recognize that analysis does not always have an input on decision; therefore, be more selective -- pick problems for analysis where you can have an impact on the decision. It is important to include in training the application of whatever you are teaching in real environments. Help the analyst recognize the limitations and problems involved in applying tools.

This particular criticism of formal analytic training -- its failure to better prepare the analyst for the vicissitudes of analysis in the real world -- seemed to hold true regardless of the source of training. We will now look more closely at these sources of training and some criticisms of present procedures and then will turn to specific recommendations for the Civil Service Commission.

Sources of Training

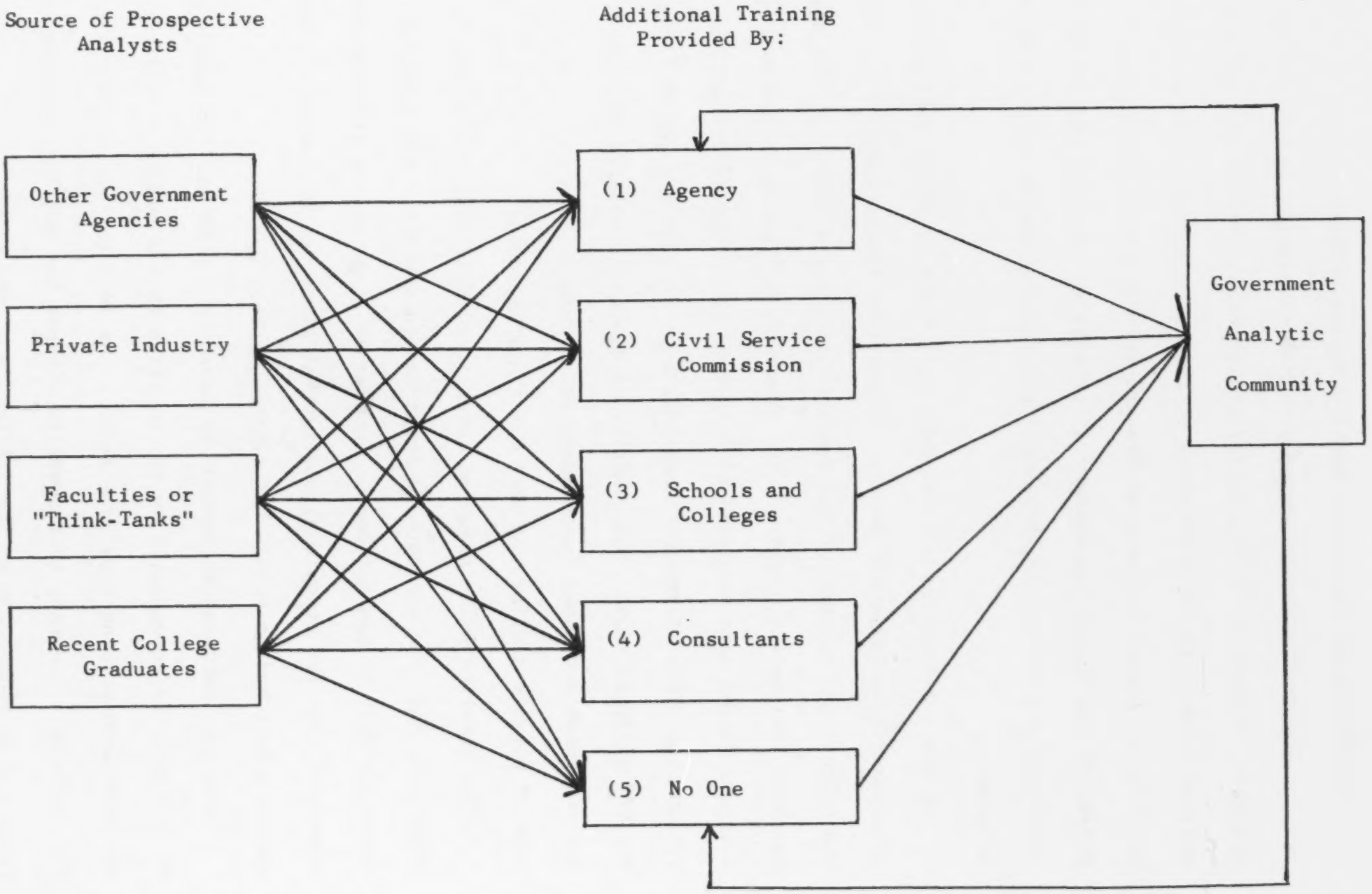
In the broadest perspective, Figure 4 illustrates the sources of PPB analysts and the ways in which they can secure training. They may come from within government, from private industry, from university faculties or "think tanks" or be recent college graduates. It is conceivable, though very unlikely at the present time, that they would already be adequately trained, in which case they would receive no further training (alternative 5) and join the analytic community.

If further training is deemed necessary, it can be provided by several sources: (1) the agency itself, (2) the Civil Service Commission, (3) schools or colleges, or (4) private consulting firms.

A number of agencies (e.g., Agriculture and the Atomic Energy Commission) developed orientation courses on PPB when it first appeared on the scene. These and other agencies (e.g., Corps of Engineers and Health, Education, and Welfare) also developed more intensive on-the-job training programs for their analysts. The PPB Fellows Program sponsored by HEW was an ambitious effort to bring prospective PPB staff into the central evaluation office for a year of training and experience. Regular seminars were established in relevant economic and mathematical techniques. This particular program, however, has been terminated because of "mixed results" and "dissatisfaction about what these people needed to know."

FIGURE 4

The Spectrum of Training Alternatives



The Financial Management and PPB Training Center of the U.S. Civil Service Commission has developed a series of courses on PPB and specific analytic techniques.[17] The Center continuously revises and updates these courses to meet the current needs of Federal agencies. It has been a major provider of formal training in PPB and through close cooperation with the Bureau of the Budget has endeavored to stay in constant contact with the evolution of the Planning-Programming-Budgeting system in the Federal Government.

A few universities and colleges have begun to offer seminars and courses with specific PPB labels. University instruction in the broader disciplines and in many of the specific techniques useful to PPB analysis has been available for years. The Educational Program in Systematic Analysis (EPSA) mentioned above[18] has been the formal government-wide mechanism for directing civil servants into an academic year of training for PPB analytic work. Some individual agencies, notably the Forest Service, have developed independent relationships with specific universities to provide similar training for their employees.

The question to be answered about this broad training effort is whether it has been adequate in scope and in content. Our research indicates that it has not been. Insofar as scope of the training is concerned, the BOB study's discovery that almost three-fourths of PPB analysts have had no formal PPB training speaks for itself.

Our conclusion about content is based on a much smaller sample and to be fair must be accompanied by the notation that a number of dedicated men have been working very hard since about 1965 to try to provide adequate PPB training. The fact that complete success has not been achieved is primarily an indication of the difficulty of the task.

The next section of this report will present our specific recommendations for improving the existing PPB training programs and follow these recommendations with additional commentary as to why they are deemed appropriate.

RECOMMENDATIONS FOR IMPROVING PPB TRAINING

Assumptions and Definitions

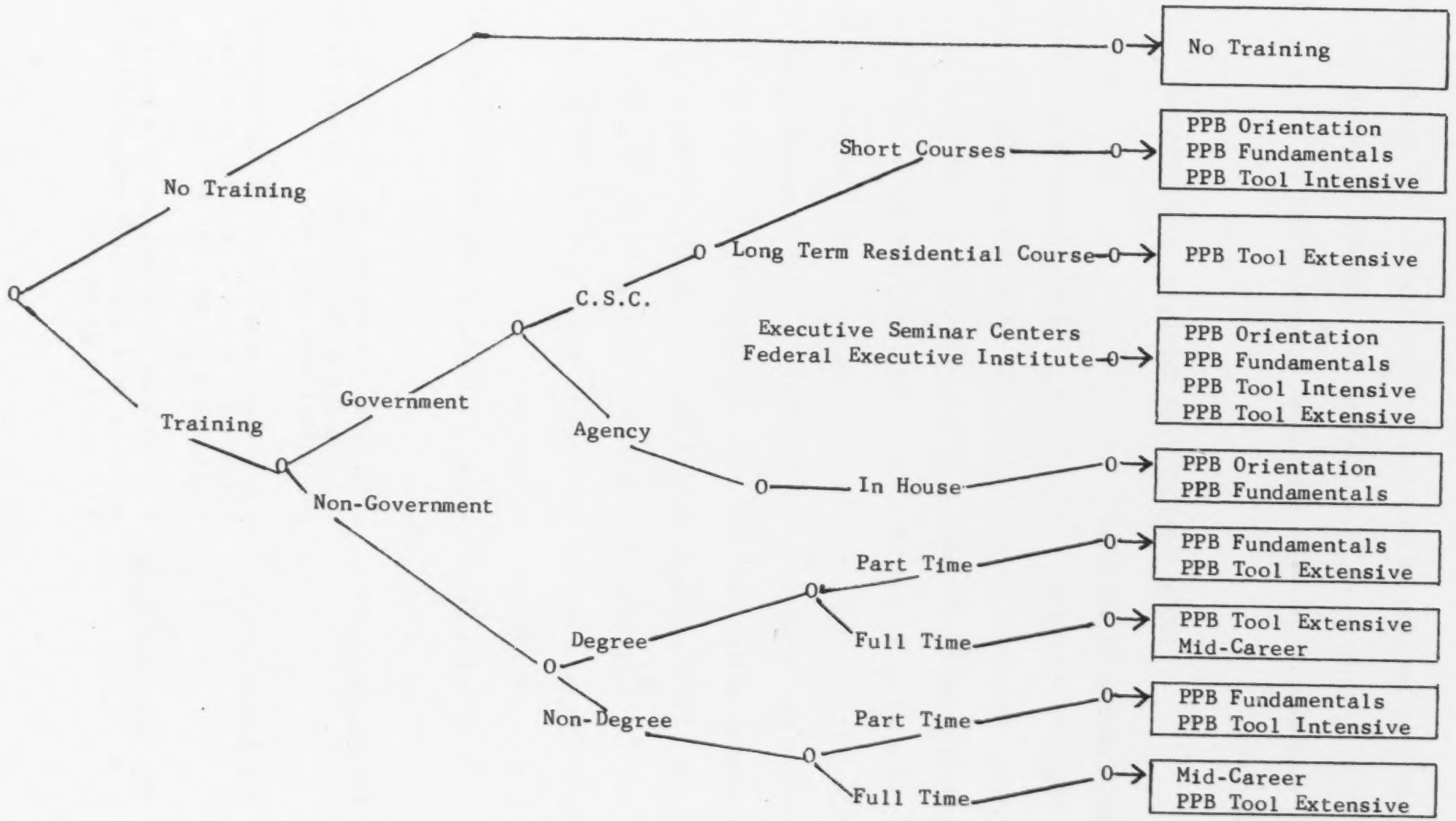
Figure 5 indicates a universe of possible training patterns for PPB analysts. Reference to the figure will help in following the present recommendations.[19] In making these recommendations several facts have been taken as given and have not themselves been subjected to analysis: (1) PPB will continue to be an evolving institution subject to alterations in concept and execution; (2) The Civil Service Commission has a leadership role in seeing that PPB training is provided to Federal Government employees; (3) A monopoly of PPB training is not desirable and consequently a variety of approaches and sponsors is to be supported; and (4) The BOB is sufficiently certain about what it wants from the PPB process to give guidance to the CSC and the agencies.

In discussing PPB training recommendations, four terms will be used and are defined as follows:

PPB Orientation:	A 12-18 hour overview of the theory of PPBS to show its purpose, basic concepts, and analytical underpinnings.
PPB Fundamentals:	A two-week course which in addition to an orientation gives a feel for the uses and limitations of specific PPB analytic tools.
PPB Tool Intensive:	A 12-30 hour introduction to a particular analytic tool imparting enough skill for elementary applications.

FIGURE 5

The Pattern of Training Alternatives



PPB Tool Extensive: The equivalent of two to three semesters of academic training in a variety of basic analytic tools imparting enough skill so that with experience an analyst can move beyond elementary applications.

Statement of Recommendations

The following recommendations are made:

1. Top Bureau of Training Civil Service Commission management should consider extending the Commission's leadership role in promoting sound PPB analytic training. Possible steps could include:

   (a) joint sponsorship with the Bureau of the Budget of a PPB Inter-Agency Training Coordinating Council (or the activation of a similar effort within existing channels) to promote a more unified approach to PPB training in the Federal analytic community.

   (b) more positive use of PPB principles in the Commission itself.

   (c) extension of PPB training to the curricula of the Federal Executive Institute and the Executive Seminar Centers.

   (d) using PPB training as a prime vehicle for promoting (and testing) the Federal role in providing training to state and local officials.

2. The Educational Program in Systematic Analysis should be refashioned in one of two ways:

   (a) establish two separate "tracks" -- one for younger Federal employees designed to turn out trained PPB analysts and one for mid-career executives in which imparting a greater appreciation for analytic decision-making is only part of a "mid-career development" program.

   (b) specify that EPSA is such a "mid-career development" program and

3. Establish a separate "PPB Tool Extensive" course for beginning analysts in the Federal service. Such a course could be handled in a variety of ways:

   (a) through a nine months EPSA-like program with colleges around the country. In this case the program should be much more tightly-integrated than the current EPSA and tailored to fit the needs of each individual.

(b) through extended, after working hours degree programs at colleges convenient to Federal employees. Such programs should fit the criteria of (a) above but would be non-residential and completed over a much longer period of time.

(c) through intensive residential programs taught by the Civil Service Commission through (1) the Financial Management and PPB Training Center, (2) the Federal Executive Institute, or (3) the Executive Seminar Centers. Such inhouse efforts would probably give the highest return for dollar expenditures.

4. Continue existing "PPB Orientation" and "PPB Fundamentals" courses but seek to expand instruction on how PPB fits into the real political world and on how its analytic techniques can be applied successfully in that environment.

5. Continue to develop and extensively promote "PPB Tool Intensive" courses, again stressing practical applications and limitations.

6. Establish programs to aid agencies in the recruitment of analytically trained college graduates.

Discussion of Recommendations

1. Top Bureau of Training and Civil Service Commission management should consider extending the Commission's leadership role in promoting sound PPB analytic training. Possible steps could include . . .

A major problem is the lack of unified direction for PPB training within the Federal Government. No agency has taken explicit responsibility for saying "this is what PPB is; these are its major principles; and this is how it should be taught." Consequently, a veritable hodgepodge of instruction in PPB is available. Some of it is excellent, but more is mediocre and a few programs are terrible. There has been a proliferation of non-governmental consulting firms attempting to teach government agencies how to do PPB. Ironically, many of these firms have contacted the Commission for advice on how to teach PPB.

(a) joint sponsorship with the Bureau of the Budget of a PPB Inter-Agency Training Coordinating Council (or the activation of a similar effort within existing channels) to promote a more unified approach to PPB training in the Federal analytic community.

The obvious place for leadership lies with the Bureau of the Budget and the Civil Service Commission. The former can supply information on what is desired from the Planning-Programming-Budgeting System and the latter can provide expert assistance in training. In this as in many areas of Federal responsibility other agencies can make positive contributions. Hence, some formal coordinating device should be activated. One would not expect a PPB training curriculum to be imposed, but at the minimum a few convincing exhortations on training content seem necessary if PPB is to become a successful technique in governmental decision-making.

(b) more positive use of PPB principles in the Commission itself.

Our research found some indications of a credibility gap vis a vis the Commission and PPB. Doubt was expressed in some quarters as to the amount of support PPB had within the Commission itself. These doubts necessarily undermine the credibility of instruction offered by the Commission -- "do as we say, not as we do."

(c) extension of PPB training to the curricula of the Federal Executive Institute and the Executive Seminar Centers.

A cursory examination indicates that very little is being done to promote PPB instruction at these important training interfaces between the Commission and the remainder of government.

(d) using PPB training as a prime vehicle for promoting (and testing) the Federal role in providing training to state and local officials.

In many respects PPB could be an excellent test subject for expanding Federal training assistance to state and local governments. The subject

of PPB is relatively new, and there is less competition from existing training sources; it started in the Federal Government and consequently the expertise is located there; it is a highly challenging subject thus demanding a very professional approach; it raises complex issues of inter-governmental relations; and there is a growing demand for such instruction within the state and local governments.

2. <u>The Educational Program in Systematic Analysis should be refashioned in one of two ways</u>:

   (a) <u>establish two separate "tracks" -- one for younger Federal employees designed to turn out trained PPB analysts and one for mid-career executives in which imparting a greater appreciation for analytic decision-making is only part of a "mid-career development" program</u>.

We did not intend EPSA to be a prime topic of our research, but our respondents commented on it at length. It is the Commission's most ambitious effort in analytic training, and yet most of our respondents expressed doubts about its efficacy as a means of training analysts. EPSA is seen as an excellent broadening experience which is most useful to the student's own intellectual development, but which is also inefficient in teaching the practical techniques of analysis. There seemed to be considerable confusion as to just what its objectives were, both for the student and for the government. Some representative comments by former EPSA students follow:

> To me EPSA is something like Headstart; it will have an eventual impact but it doesn't help much in dealing with current problems.

> My year at MIT was great, but in terms of training of analysts they aren't doing it. What I had there in terms of systems analysis and skills, the government could have had for a minute fraction of the cost through night school and seminars.

> I would much prefer a tightly-integrated program rather than the smorgasbord of college courses. In those courses we would just get half-started on a method of analysis without enough practice.
>
> I felt that EPSA was especially successful if its purpose was personal development of the participants. I gained an appreciation of other agencies' problems and methods.
>
> If EPSA was meant to give the individual a year of personal growth and education, it succeeded, but if it was meant to produce functional mathematical analysts, it fails unless the participants gained immediate practical experience upon completion.

The most obvious problem was confusion over objectives: Am I on campus to learn how to be a practicing PPB analyst or to broaden my intellectual perception of the world by becoming more aware of the contributions which analysis can make to decision-making? The problem was compounded on many campuses by the latitude given to the student to choose his own course of study depending upon how he interpreted the objectives of the program and his own needs.

The second problem was the perennial academic dilemma over whether to teach theory or practice. Since most academicians know the former much better than the latter, most college courses contain a heavy emphasis on theory. There are, of course, legitimate reasons why this should be so. Among others the very purpose of developing theory is to lessen dependence upon inefficient trial and error methods of learning. It does not make sense to send students to a college environment if it is not intended for them to devote a considerable amount of effort in developing a theoretical understanding of the subject matter.[20] The college experience, however, should also give the student new knowledge and tools which are useful to him in his analytic work.

A number of cost/benefit questions are appropriate to a discussion of EPSA but fall beyond the scope of this report.

It would be logical to encourage EPSA to develop in either of two separate directions: technical training for practicing analysts; or mid-career development for more senior officials who need to gain an appreciation for what analysis can provide. Some such clarification of purpose followed by an effort to better tailor the academic program to the needs of the individual student seems essential.

(b) <u>specify that EPSA is such a "mid-career development" program and . . .</u>

Several respondents noted the heavy investment being made through EPSA in relatively young men with less than solid ties to a government career. If a turnover in EPSA graudates should occur, this would be a strong argument for restricting the program to individuals more firmly settled in a government career.

3. <u>Establish a separate "PPB Tool Extensive" course for beginning analysts in the Federal service. Such a course could be handled in a variety of ways . . .</u>

There is a gap in PPB analytic training in that presently no program of study is turning out younger analysts professionally equipped to utilize the wide gamut of analytic techniques. Orientation courses and Fundamentals courses start potential analysts in the right direction; academic courses give them a good theoretical background, but there is no complete program for turning out proficient analysts. The would-be analyst is in much the same position of the would-be lawyer a century ago -- he has to serve as an apprentice in the office of the professional for a considerable time in order to learn how to perform in the real world.

The need for experience will never be eliminated, but there are ways to shorten the time lag through more effective instructional programs.

(a) <u>through a nine months EPSA-like program with colleges around the country. In this case the program should be much more tightly-integrated than the current EPSA and tailored to fit the needs of each individual</u>.

Prospective PPB analysts seem to fall into two categories: those with and those without quantitative backgrounds. The former need broadening in the sense of an exposure to broader issues of public policy and public administration; the latter need an intensive introduction to mathematics. Both need rigorous training in how quantitative analysis can be applied in a real world of governmental decision-making which is highly resistent to formulas and quantification. The program recommended here should seek to build upon EPSA's experience but insist upon careful planning of an individual's program to fill in specific gaps in his background. It should also enable him to become a practicing analyst shortly after returning to government.

In addition to the administrative manpower requirements for such an approach, there is considerable room to doubt if many colleges would be interested in cooperating in such a program. College faculties have little interest in non-degree programs oriented toward "nuts and bolts" techniques. Careful planning is needed to develop a program of study which combines the academic and governmental view as to what is appropriate for such a program. The development of appropriate degree programs is in itself a difficult task. Another problem is the more than $20,000 cost of sending a government employee away to school for a year. Again, a cost/benefit analysis seems desirable.

(b) through extended, after working hours degree programs at colleges convenient to Federal employees. Such programs should fit the criteria of (a) above but would be non-residential and completed over a much longer period of time.

The after-hours approach would be consistent with much encouragement for personal development which is being given to employees throughout the government. It would reduce the cost of dislocation and loss of service while in school. It would, of course, be a much slower method of developing analysts but over a long time frame could be an important method of building a solid force of trained analysts. The key difficulty would be developing appropriate courses of study at a sufficient number of colleges. Although difficult, this task would not be impossible. The implementation of other recommendations[21] would provide complementary support. In addition, a number of colleges are beginning to add courses in quantitative analysis to other than their traditionally quantitative disciplines. With proper leadership there is no reason why these could not be used very successfully in PPB analytic training. Appendix I, for example, lists appropriate individual courses now available in the Washington metropolitan area.

(c) through intensive residential programs taught by the Civil Service Commission through (1) the Financial Management and PPB Training Center, (2) the Federal Executive Institute, or (3) the Executive Seminar Centers. Such inhouse efforts would probably give the highest return for dollar expenditures.

Even with the utilization of these other alternatives, there are strong arguments for an inhouse "PPB Tool Extensive" training course offered by the Civil Service Commission. College training is inevitably going to be slow, expensive, and theory-oriented. There is an urgent need now for trained PPB analysts. Our research as discussed above indicates that current and costly programs are not providing these analysts in the number needed or

with the desirable degree of understanding of how to apply these techniques in the real world of political decision-making. A three or four month intensive, residential course (or the equivalent in a sequence of several shorter courses) could provide such practically-trained analysts much more quickly and at less cost than through university programs. Appendix II shows one such sample program as outlined for the BOB study's draft report.

4. Continue existing "PPB Orientation" and "PPB Fundamentals" courses but seek to expand instruction on how PPB fits into the real political world and on how its analytic techniques can be applied successfully in that environment.

This recommendation is basically an admonition to continue what is now being done. Current course offerings of the Financial Management and PPB Training Center seem to be well appreciated by the agencies. Their main request is to provide more information on applications. This the training staff constantly seeks to do.

5. Continue to develop and extensively promote "PPB Tool Intensive" courses, again stressing practical applications and limitations.

The discussion above in relation to the analytic continuum[22] noted that a wide variety of analytic tools is applicable to PPB analysis with considerable differences in the degree of usefulness from one agency to another. Our research also indicates that as analysts and agency decision-makers gain more experience, more sophisticated techniques become useful. These findings indicate that courses on specific techniques (for example, basic data analysis, probability and decisions, sampling and statistical inference, correlation and regression analysis, and linear programming) should be increasingly helpful as the use of PPB analysis grows.

The effective development of these courses will depend upon available staff resources and an extensive effort to recruit agency personnel for this more demanding instruction.

6. Establish programs to aid agencies in the recruitment of analytically trained college graduates.

One way of increasing the supply of trained PPB analysts is, of course, to recruit already trained college graduates. As colleges begin to turn out more such graduates, this should become a productive technique. The problems involved should be similar to those accompanying any effort the Commission makes to attract scarce and expensive professionals into the public service.

EXTRA-SYSTEM CONSTRAINTS ON PPB ANALYSIS TRAINING

In conducting this study it was decided to ignore some important factors because they fell beyond the reasonable scope of research or the power of our recommendations to influence. The first of these factors is the continuing debate over the nature, purpose and most efficient procedure for Planning, Programming and Budgeting.

Professor Donald Escarraz has catalogued four basic approaches to PPBS:[23] the welfare economic approach, the fiscal economic approach, the systems analysis approach, and the systematic analysis approach. The latter is the least ambitious and amounts to scarcely more than encouraging the use of analysis wherever an analyst manages to get a foot in the door of decision-making. Excarraz notes that it is the only version of PPB which is likely to succeed without strong and definitive leadership from the Bureau of the Budget. He and other students of PPB conclude that the BOB has not provided such leadership.[24]

Perhaps the most critical of the BOB's approach to PPB has been Samuel M. Greenhouse, author of "Today's PPBS: The Fatal Triumph of 'Financial Management Over Economics."[25] Greenhouse feels that the BOB

was too overpowered by the pressures of the on-going budgetary process to install what was really necessary -- "a new, economic approach to Federal decision-making, rooted in the marginal utility theory of value."[26] As noted above, it is his conclusion that an "economic-PPB" is necessary to cope with the economic enterprise activities of government in a rational manner.

Other critics represent a variety of positions ranging from those who feel that PPB is doomed to failure because it is impossible to "do PPB" to those who accept the concept but disagree with the current machinery. The intensity of present research activity within the BOB itself indicates that at least some officials there are willing to alter current procedures.

In the face of this uncertainty, there is an obvious need for the Civil Service Commission to remain flexible in its approach to PPB analytic training.

A second major constraint on the PPB training role of the Civil Service Commission is the problem of instructor manpower. If additional responsibilities are to be undertaken, additional personnel will be needed. The extent to which these personnel should be employed directly by the Commission or by other government agencies or utilized through contractual arrangements is an important topic beyond the scope of the current research effort.

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APPENDIX I

Sample of Existing University Courses Useful
for Quantitative Analytic Training

1. AMERICAN UNIVERSITY

Economics

19.541 Public Finance II
19.542 Public Finance II
19.521 Quantitative Economic Analysis
19.523 Econometrics
19.721 Mathematical Economics
19.722 Econometrics

Center of Technological Study

55.511 The Systems Approach
55.540 Operation Research in Management
55.542 Probability & Statistics for Management Decisions
55.544 Advanced Management Mathematics
55.641 Methods of Operations Research I
55.642 Methods of Operations Research II
55.666 Cost-Benefit Analysis

School of Government & Public Administration

54.640 Federal Fiscal Policy
54.643 Government Program & Budget
54.644 Federal Budgetary Procedure

10.657 Planning-Programming-Budgeting (Business Administration)

19.541 Fiscal Theory & Planning (Economics)

2. GEORGETOWN UNIVERSITY

Economics

201-02 Economic Theory
301-02 Math Economics
307-08 Cost/Benefit Analysis of Government Economic Policy
211-212 Economic Statistics
217-218 Quantitative Economics & Computer Applications
411-412 Seminar in Quantitative Research Methods
422 Estimating Monetary Requirements for Economic Policy
331 Theory of Public Finance
332 Public Finance & Fiscal Policy

Government

207 Quantitative Techniques

3. GEORGE WASHINGTON UNIVERSITY

Economics

203-4 Microeconomic Theory
205 Macroeconomic Theory
215-16 Mathematical Economics
253 Productivity Analysis -- Business & Government
261 Welfare Economics
263 Theory of Public Finance I
264 Theory of Public Finance II

Public Administration

251 Governmental Budgeting
252 Problems in Planning-Programming-Budgeting
254 Seminar -- Financial Management in Federal Service

Statistics

207-8 Operations Analysis
269-70 Statistical Decision Theory
271-72 Statistical Information Theory

4. UNIVERSITY OF MARYLAND

Economics

111 Quantitative Methods in Economics
142 Introduction to Public Finance
200 Micro-Economic Analysis
201 Advanced Micro-Economic Analysis
212 Macro-Economic Analysis
209 Welfare Economics
211 Quantitative Economics I
212 Quantitative Economics II
237 Case Studies in Cost/Benefit Analysis
242 Public Finance Advanced Theory & Seminar
243 Public Finance Advanced Theory & Seminar
246 Public Sector Workshop

APPENDIX II*

SAMPLE PPB TOOL EXTENSIVE TRAINING PROGRAM

About 600 of the present 800 program analysts need skills upgrading. Even if recruitment of new analysts is done from within agencies, or from other sources which provide program knowledge, analytic training for new program analysts will be necessary. Future senior analysts will require more training in analysis than most present journeymen analysts have and will also require broadening of perspective. Budget people and program people need to understand the use and usefulness of analysis. For these reasons, a comprehensive training system for program analysis is required.

Such a system should include: (1) orientation for budget and program people, (2) analytic skills training for junior and journeymen analysts, (3) upgrading of analytic skills and their applicability to major program issues, for senior analysts as suggested by the Training Needs and Program Table on page [Not in present study].

Agencies should do much of their own orientation for their employees. Both VA and AEC have done so with apparent good results. Planning and Program Analysis is well regarded in AEC. Program managers are involved in the PPB system and in analysis at VA. However, present efforts by the Civil Service Commission, the orientation courses, and the two-week seminar should be continued as supplementary to the existing and proposed in-house orientation.

At present, only the Educational Program in Systematic Analysis (EPSA)

*Originally appeared as Appendix V in the draft report of the Bureau of the Budget Study on PPB Implementation.

provides skills training or examines the analysis applicable to major programs. So far about 175 people have completed EPSA and about 65 are presently at school. Continued evaluation should be done of EPSA's effectiveness in producing analysts and that objective itself should also be open to analysis. One possible future objective for EPSA offered for consideration would be for EPSA to be used to upgrade senior analysts. It is clear that training 600 analysts or providing analytic competence for new staffs by using EPSA is expensive and time consuming (about $20,000 each ten months). Expanding the annual capacity of EPSA from its present level of 65 would certainly involve using additional universities if that expansion were beyond 100 students. Finding and negotiating with universities is an option but curriculum adjustments are likely to be necessary over the first two years and some schools would drop the program if experience is a guide. Continuing to use EPSA at its present level means taking perhaps nine years to get to the initial 600 -- clearly untenable. Preliminary analysis by the Civil Service Commission suggests much of the analytic skills and conceptual bases could be taught in approximately 16 weeks.

Operating a 16-week course with three concurrent sessions for classes of 22 people each, with three courses per year would produce 200 analysts a year. (That is, 3 classes X 22 each X 3 courses = 198 in a 48 week period.) Preliminary cost estimates indicate $3,000 per student plus 16 weeks salary of up to $5,500 (based on $18,000/year) for a total of $8,500/man. That is expensive, but for $8,500 and 16 weeks, it is less than $20,000 and 10 months. A possible curriculum would be:

Course	8 Weeks	8 Weeks
Economics (micro, govt)	3 hrs./wk.	3 hrs./wk.
Probability (theory & mathematics)	3 hrs./wk.	
Statistics (classical and technical)		3 hrs./wk.
Introduction to Systems Analysis (lecture, synthesis of other disciplines)	5 hrs./wk.	
Case Studies in Analysis (practice in systems analysis)		5 hrs./wk.
Workshop in Techniques (specific techniques as linear and dynamic programming)	5 hrs./wk.	
Program Analysis of Agency Problem (chosen by student and agency)		5 hrs./wk.
Management Information Systems and Computer Programming	4 hrs./wk.	4 hrs./wk.
TOTAL CLASS TIME	20 hrs./wk.	20 hrs./wk.

The remaining 20 hours/week would be for study, research, and preparation. Cost estimates include space, equipment, books, faculty, and staff.

If such training were available to teach analysis, the possibility of using EPSA to focus on senior analyst training, upgrading, and perspective broadening would exist.

Other short courses presently in existence may be of use in introducing concepts and providing basic workshop experience in their use (Cost/Benefit Workshop, Introduction to Cost Analysis, Models in Management Decisions).

NOTES

[1] Comptroller General of the United States, Survey of Progress in Implementing the Planning-Programming-Budgeting System in Executive Agencies (U.S. Government Printing Office, July 29, 1969), pp. 46-47.

[2] The BOB/CSC study is as yet unpublished although a preliminary draft has been made available to the author. The GAO study is cited in footnote 1.

[3] Data collected by the BOB study and made available to the author indicates that of a sample of 358 individuals connected with PPB analysis in 11 agencies, there were 35 separate position classifications represented. The six listed in the following table were most frequently cited.

[4] As stated in the CSC qualification standards.

[5] GAO, op. cit., p. 27.

[6] Ibid.

[7] "The Application of Systems Analysis to Government Operations" (National Institute of Public Affairs, 1966), p. 4.

[8] Some implications of this debate are discussed below in the section on "Extra-System Constraints on PPB Analysis Training," p. 42.

[9] Jack W. Carlson, "The Status and Next Steps for Planning, Programming, and Budgeting" in the Joint Economic Committee's Compendium of Papers on The Analysis and Evaluation of Public Expenditures: The PPB System (U.S. Government Printing Office, 1969), p. 631.

[10] GAO, op. cit., pp. 27-28.

[11] These questionnaires had been collected as part of a continuing evaluation of the EPSA program and not specifically for input to the present study.

[12] As PPB analysts develop experience and their analyses are accepted by agencies, it would be expected that the sophistication of analysis and its application to higher level problems would increase.

[13] Two of these were non-Federal -- units within the New York City government.

[14] This point is supported by the widely reported discomforture of aerospace firms which attempted to apply such techniques a few years ago to California's urban problems. Along the same line, the RAND Corporation has found its current project with New York City a real learning experience. Randy Hamilton in the Public Administration Review (July/August 1969, p.434) quotes Donald Scott of RAND, "'This has certainly been an education for the RAND Corporation. There were certain comfortable simplicities about research on defense. But not here. The complexity of the fiscal and political element, the complexity of the human element, the plain complexity of New York City, are something we haven't encountered before.'"

[15] Note that this study because of time limitations did not consider the viewpoint of the non-analyst decision-maker who is the customer for the analytic product.

[16] These figures are averages of totals presented separately for central agency personnel and bureau personnel in the BOB study.

[17] The courses listed for the last half of 1969 included the following: Planning-Programming-Budgeting Seminar (two weeks); Executive Orientation in PPB (3 days); General Orientation in PPB (2 days); Cost/Benefit Workshop (5 days); Models for Management Decisions (5 days); Systems Analysis for Government Operations (3 days); Analytic Techniques for Public Managers (several 2-3 day courses); Introduction to Cost Analysis (3 days); and Finance in Agency Management (5 days).

[18] P. 14.

[19] These recommendations refer primarily to steps which are within the province of the Civil Service Commission.

[20] This can be a painful experience for all concerned, however. The author well remembers a year-long public administration seminar which he as a doctoral candidate shared with six NIPA mid-career fellows. It takes almost a superhuman effort to meet the educational needs of both Ph.D. candidates and mid-career government executives in the same classroom.

[21] Especially 1.(a) and 3.(a).

[22] P. 7.

[23] "PPBS and the National Government: Alternative Approaches," National Tax Journal (June, 1968), pp. 130-40.

[24] Four of the most recent critiques of the PPB system as it has evolved appear in Part V, Section B, of the Joint Economic Committee's Compendium on PPB, op. cit., pp. 817-98.

[25] Ibid., pp. 886-98.

[26] Ibid., p. 887.

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